METHOD AND APPARATUS FOR VEHICULAR ORDERING OF RADIO-BASED PROGRAMS

This application is a continuation of U. S. Patent Application Serial Number 09/422,131 which was filed on October 20, 1999.

Technical Field

This invention relates to an ordering method and apparatus for broadcast radio programs used by a person in motion.

Background Art

Many people spend significant amounts of time traveling on a regular basis. Commuters using automobiles and mass transport fill the streets and transportation depots of many metropolitan areas several times a day for many hours. Others using bicycles and other wheeled vehicles are seen not only at rush hours, but also at other times throughout the week and on holidays. Still others prefer to long distance running and walking. All of these people have the opportunity to purchase radio receivers which enable them to enjoy broadcast radio programs of a wide variety, including entertainment such as music, dramatic productions, comedies, interviews, story telling sessions, as well as news and other factual radio programs including investment shows as well as advertisements and/or commercials.

Figure **1** depicts typical prior art vehicular radio receivers and cellular telephones. The basic receiver **10** of today often possesses an indicator **2** visually presenting some status information, such as whether the FM receiver is active, and if so, its tuner frequency. There is often a door **4** permitting loading and unloading of audio

recording media, such as cassette tapes or CD's. Other alternatives include downloaded audio files on nonvolatile memory components. There is usually an array of push buttons **6**, which may be arranged in a variety of configurations, which may or may not form a regular pattern. Sometimes there are dials **8**. This basic receiver **10** is usually able to receive both AM and FM broadcasts as well as often play recorded material such as cassette tapes or CDs. Audio output is often achieved in automobiles using speakers **12** and **14** coupled to the receiver **10** by wires **16** and **18**, respectively.

Other kinds of commuters and travelers usually cannot afford the space of separately detached speakers. Another solution includes a headset **20** including left and right speakers **22** and **24** sometimes with all the electronics for broadcast radio reception being resident in the headset **20**, sometimes with an antenna **30**. Volume and tuning controls **26** are often mounted on the earphone-speaker sections such as **22**. Batteries **28** are often mounted in the headset **20** as shown. A further progression includes an addition of microphone **34** attached by a mount **32** to the headset. Still further refinements include cabling **40** to a unit **42**, which is often mounted on a belt.

This belt-mounted unit **42** often contains the active electronic components of the basic receiver **10** discussed above. Belt-mounted unit **42** often further contains an indicator **44** visually presenting some status information, a door **46** permitting loading and unloading of audio recording media and an array of push buttons **48**. Such units **42** usually receive both AM and FM broadcasts as well as often play recorded material such as cassette tapes or CDs.

Some performing artists use versions of devices resembling these units **20-40-42** in place of hand held microphones and headsets. In such circumstances, the units act

as transceivers, similar to cellular telephones, although with higher fidelity than standard cellular telephones. Additionally, cellular telephones **50** possessing a microphone **52** and earphone **54**, a push button array **56** and sometimes an antenna **58** have become common throughout much of the world.

Figure **2** depicts a simplified block diagram of a typical, prior art broadcast radio receiver. FM antenna **100** is coupled **102** to FM Tuner **104**. FM Tuner **104** is coupled **106** to FM Intermediate Frequency Processor (IF) **110**, from which the stereo audio signals **110** are presented to Analog Multiplexer/Switch **150**. AM antenna **120** is coupled **122** to AM Tuner **124**. AM Tuner **124** presents the audio signal **126** to Analog Multiplexer/Switch **150**. Tape drive **140** is coupled **142** to Tape Preamp **144**. Tape Preamp **144** presents the stereo audio signals **146** to Analog Multiplexer/Switch **150**.

Analog Multiplexer/Switch **150** is usually manually controlled to select from a collection of inputs such as discussed above. It generates one or more audio signals **162** which are presented to Tone and Volume Control **160**, which generates audio signals **166** which are presented to one or more power amplifiers **164**. Power amplifiers **164** generate one or more audio signals presented **170** to Audio Speaker System **168**. The Audio Speaker System **168** involves one or more speakers, which may reside in a headset, rigidly mounted on the sides of an enclosure such as a boom box, or distributed some distance from each other, as in an automobile. Often the mechanism of presentation **170** to the audio speaker system is through a wire-based physical transport layer, but in certain situations, it may be through a wireless physical transport layer. These systems have been a staple of the consumer electronics market for a quarter of a century, remaining virtually unchanged in that

time. However, there are some frustrations associated with such systems and the above mentioned cellular telephones.

There is a subsidiary FM signal protocol known as RDS in the United States (and often referred to as RDBS in Europe), which has been adopted and deployed in a number of radio markets within the United States. RDS specifies a sub-band within the channel bandwidth of a standard FM broadcast station, which does not interfere with the audio sub-band of the FM transmission. The sub-band is currently used to broadcast digital information such as standard identification information of the standard broadcast station. From certain perspectives, this sub-band can be viewed as a sub-carrier used for additional analog and/or digital information.

Figure **3** depicts an exemplary prior art mobile computer **200** capable of being installed in an automobile. Computer **200** typically is designed to mount on or near the dashboard of an automobile, but could conceptually be mounted on the handle bars of a bicycle. Assembly **202-204-206** acts as a selection device similar in some ways to a mouse or joy stick. Push plate **204,** when depressed away from its center, selects a region such as **206**. Region **202** in certain situations contains a number of designations useful in selecting specific common options. Display **210** portrays the state of the computer, providing the main user output. Buttons **212**, **214** and **216** provide a further array of user tactile inputs.

Systems such as this have recently come onto the market here in the United States. Many of these systems run handheld computer operating systems and often feature menu driven control systems further accessing one or more nonvolatile memory systems, such as CDs, disk drives or nonvolatile semiconductor memories. However, even with such new systems, there are some frustrations associated with this kind of device and the above mentioned radio receivers and cellular telephones.

Consider the situation where there is an interest in buying a copy of the radio program either being heard or having just been heard. How is this to be done? Today one faces an inherently frustrating situation. One approach is to somehow note what was played. One might call some distributor on the telephone to order the radio program. This is often at least distracting, if not dangerous, for motorists, whose life and health, as well as the lives and health of those around them, depends upon them staying focused on driving. For other most people in motion, simultaneously dealing with a cellular telephone and a broadcast radio receiver would be quite inconvenient, if not again distracting and potentially dangerous.

One might wait to visit a store selling such merchandise. This requires that somehow one remember what was played and who performed it at the least. In almost all the situations described above, this is again inconvenient, distracting and potentially dangerous.

An alternative would be to note the radio program, channel and broadcast time and use this information to order the radio program. Such a system has been recently granted a patent (US Patent No. 5,539,635). Characteristic of such systems is the following description of the user's actions to order a radio program taken from the Summary of the Invention (column 2, lines 18-21). "A customer uses her telephone to call into the system and gives the date, time, and broadcaster of when she heard each requested program broadcasted." This would again be inconvenient, distracting and in many circumstances for people in motion, dangerous.

An additional problem confronts the user in motion: financial information disclosure. Cellular telephones can often be overheard electronically. In mass transports, people in the vicinity of a user may well overhear critical identifying information such

as credit card or subscriber numbers. Similar situations often occur for individuals on bicycles and on foot.

What is needed is a method of ordering radio programs which is convenient, extremely easy to perform while in motion and simultaneously capable of being secure. What is also needed is a class of radio devices supporting such methods of ordering. What is also needed is a method of controlling such radio devices so users may order radio programs in the manners discussed hereinafter.

Disclosure of the Invention

The present invention answers all of these needs. The method of use presents an extremely efficient manner of ordering a radio program occurring at approximately the time presented, minimizing the need to remember any details. The method is embodied in a range of tactile and voice controls which people in motion need to have. Security options include voice signatures, button sequences and fingerprint identification. User feedback is embodied in both audio and visual display formats.

The radio device supports an IF signal source containing essential information on the radio program, an embedded controller, user interface as well as a radio transceiver by which the ordering transaction is carried out. The IF signal source may be digital or analog. The embedded controller contains a writeable nonvolatile memory supporting the control program and security signatures. The user interface supports push buttons, audio input and output to the user, as well as visual output to the user and a fingerprint scanner. The radio transceiver may be embodied as a cellular telephone or bi-directional pager.

The method of controlling the radio supports the basic actions of placing an order, querying the ordering system for additional information, initializing a user's identifying signature, initializing a session by identifying a user, blocking access to ordering if the user is not identified, and in certain embodiments, calling the police. In certain embodiments, the user's identifying signature may include one or more of button sequences, voice signature and fingerprint.

These and other advantages of the present invention will become apparent upon reading the following detailed descriptions and studying the various figures of the drawings.

Brief Description of the Drawings

Figure **1** depicts typical prior art vehicular radio receivers;

Figure **2** depicts a simplified block diagram of a typical, prior art broadcast radio receiver;

Figure **3** depicts an exemplary prior art mobile computer capable of being installed in an automobile;

Figure **4** depicts a flowchart of using a vehicular radio-based program selection and ordering system in accordance with an embodiment;

. Figure **5** depicts a detail flowchart of operation **1008** of Figure **4**, which selects the radio program near the time of the radio program presentation in accordance with certain embodiments;

Figure **6** depicts a detail flowchart of operation **1008** of Figure **4**, which selects the radio program near the time of the radio program presentation in accordance with certain embodiments;

Figure **7** depicts a detail flowchart of operation **1012** of Figure **4**, which perceives the radio program selection confirmation in accordance with certain embodiments;

Figure **8** depicts a detail flowchart of operation **1012** of Figure **4**, which perceives the radio program selection confirmation in accordance with certain embodiments;

Figure **9** depicts a flowchart of additional operation **1120** of identifying a vehicle owner to operation **1000** of Figure **4** in accordance to certain embodiments;

Figure **10** depicts a detail flowchart of operation **1016** of Figure **4** responding to radio program selection confirmation in accordance to certain embodiments;

Figure **11** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments;

Figure **12** depicts a flowchart of additional operation **1190** of initializing the owner identifying signature sequence to operation **1120** of Figure **9** in accordance to certain embodiments;

Figure **13** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments;

Figure **14** depicts a flowchart of additional operation **1190** of initializing the owner identifying button sequence to operation **1120** of Figure **9** in accordance to certain embodiments;

Figure **15** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments;

Figure **16** depicts a flowchart of additional operation **1270** of initially pressing the fingerprint scanner to operation **1120** of Figure **9** in accordance to certain embodiments;

Figure **17** depicts a detail flowchart of operation **1142** of ordering the radio program selection Figure **10** in accordance to certain embodiments;

Figure **18** depicts a flowchart controlling a vehicular radio-based program selection and ordering system;

Figure **19** depicts a detail flowchart of operation **1404** of Figure **18** receiving a coded radio program data channel in accordance to certain embodiments;

Figure **20** depicts a detail flowchart of operation **1412** of Figure **18** sensing the radio program in accordance to certain embodiments;

Figure **21** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation in accordance to certain embodiments;

Figure **22** depicts a detail flowchart of operation **1420** of Figure **18** sensing the response to the displayed radio program confirmation in accordance to certain embodiments;

Figure **23** depicts a detail flowchart of operation **1532** of Figure **22** ordering the radio program in accordance to certain embodiments;

Figure **24** depicts another flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments;

Figure **25** depicts a detail flowchart of operation **1412** of Figure **18** determining selection of the sensed radio program in accordance to certain embodiments;

Figure **26** depicts a detail flowchart of operation **1562** of Figure **22** determining to order the selected radio program in accordance to certain embodiments;

Figure **27** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments;

Figure **28** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments;

Figure **29** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments;

Figure **30** depicts another flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments;

Figure **31** depicts a detail flowchart of operation **1762** of Figure **30** initializing a usage session for a first user utilizing the signature for the specific user in accordance to certain embodiments;

Figure **32** depicts a detail flowchart of operation **1790** of Figure **31** blocking access by the first user whenever the comparison is non-matching in accordance to certain embodiments;

Figure **33** depicts a high level system block diagram showing a computer with several forms of memory which in different embodiments provide residence for programs implementing the disclosed and claimed methods of controlling a vehicular radio;

Figure **34** depicts a summary flowchart of using a vehicular radio-based program selection and ordering system in accordance with an embodiment;

Figure **35** depicts a summary flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments;

Figure **36** depicts a system block diagram of a radio for receiving a radio program data channel, and conducting transactions in accordance with certain embodiments;

Figure **37** depicts a detail system block diagram system block **2002**, a receiver of the radio program data channel as shown in figure **36** in accordance with certain further embodiments;

Figure **38** depicts a detail system block diagram of radio program data channel isolator **2030** as shown in figure **37** in accordance with certain further embodiments wherein the external IF signal input port supports an analog signal protocol;

Figure **39** depicts a detail system block diagram of analog isolation circuit **2050** as shown in figure **38** in accordance with certain further embodiments wherein the external IF signal input port supports an analog signal protocol;

Figure **40** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface audio output interface providing audio output of the user output data;

Figure **41** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface audio input sensor providing an user audio input data stream;

Figure **42** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a visual output device providing visual output of the user output data;

Figure **43** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface tactile input sensor providing an user tactile input data stream;

Figure **44** depicts a detail system block diagram of user interface tactile input sensor **2140** as shown in figure **43** in accordance with certain embodiments supporting a user interface tactile input sensor including a button sensor;

Figure **45** depicts a detail system block diagram of user interface tactile input sensor **2140** as shown in figure **43** in accordance with certain embodiments supporting a user interface tactile input sensor including a fingerprint scanner;

Figure **46** depicts a detail system block diagram of radio transceiver **2010** as shown in figure **36** in accordance with certain embodiments supporting the radio transceiver including a cellular telephone; and

Figure **47** depicts a detail system block diagram of radio transceiver **2010** as shown in figure **36** in accordance with certain embodiments supporting the radio transceiver including a bi-directional pager.

Detailed Description of Preferred Embodiments

Figures **1**, **2** and **3** refer to prior art and were previously discussed in the Background of the Invention.

Discussion of Primary Terms as used herein:

Radio-based programs refer to recognizable programming entities available upon a wireless broadcast physical transport. Radio-based programs include but are not limited to presentations of entertainment, education, news and commentary. Such presentations include but are not limited to copyrighted music, dramatic productions, storytelling, comedies, interviews and news stories. Such presentations also include but are not limited to stock market analyses and reports as well as advertisements and commercials.

Vehicular radio refers to radio systems supporting reception of broadcast radio-based programs in venues where the listener is either in motion, such as a bicycle, running, roller blading, skateboarding, or driving an automobile, truck, van or motorcycle.

Vehicle button array refers to one or more buttons which the vehicular radio user may touch or press and which affects the operation of the vehicular radio.

Embedded controller refers to a digital control system, including but not limited to, a computer coupled to a computer readable memory. Readable memory may include more than one kind of computer memory, such as CD ROMs, disk drives, RAM, nonvolatile semiconductor memory and removable storage devices coupled to the embedded controller by a removable storage interface. Removable storage devices include but are not limited to floppy disks, CD's, and semiconductor disks.

Writeable non-volatile memory refers to non-volatile memory including at least one accessible word which may be purposefully altered. Non-volatility memory will retain its contents when power is no longer supplied to the memory.

Figure **4** depicts a flowchart of using a vehicular radio-based program selection and ordering system in accordance with an embodiment of the present invention. Operation **1000** starts the operations of this flowchart. Arrow **1002** directs the use from operation **1000** to operation **1004**. Operation **1004** performs perceiving a radio program presentation. Arrow **1006** directs the usage from operation **1004** to operation **1008**. Operation **1008** performs selecting the radio program near the time of the radio program presentation. Arrow **1010** directs the usage from operation **1008** to operation **1012**. Operation **1012** performs perceiving the radio program selection confirmation. Arrow **1014** directs the usage from operation **1012** to

operation **1016**. Operation **1016** performs responding to the radio program selection confirmation. Arrow **1018** directs the usage from operation **1016** to operation **1020**. Operation **1020** terminates the operations of this flowchart.

Figure **5** depicts a detail flowchart of operation **1008** of Figure **4**, which selects the radio program near the time of the radio program presentation in accordance with certain embodiments. Arrow **1040** directs the use from starting operation **1008** to operation **1042**. Operation **1042** performs acoustic signaling selecting of said radio program. Arrow **1044** directs the usage from operation **1042** to operation **1046**. Operation **1046** terminates the operations of this flowchart.

Figure **6** depicts a detail flowchart of operation **1008** of Figure **4**, which selects the radio program near the time of the radio program presentation in accordance with certain embodiments. Arrow **1060** directs the use from starting operation **1008** to operation **1062**. Operation **1062** performs pushing at least one button to signal selecting of said radio program. Arrow **1064** directs the usage from operation **1062** to operation **1066**. Operation **1066** terminates the operations of this flowchart.

Figure **7** depicts a detail flowchart of operation **1012** of Figure **4**, which perceives the radio program selection confirmation in accordance with certain embodiments. Arrow **1080** directs the use from starting operation **1010** to operation **1082**. Operation **1082** performs hearing a radio program selection description. Arrow **1084** directs the usage from operation **1082** to operation **1086**. Operation **1086** terminates the operations of this flowchart.

Figure **8** depicts a detail flowchart of operation **1012** of Figure **4**, which perceives the radio program selection confirmation in accordance with certain embodiments. Arrow **1100** directs the use from starting operation **1010** to operation **1102**.

Operation **1102** performs reading a radio program selection description. Arrow **1104** directs the usage from operation **1102** to operation **1106**. Operation **1106** terminates the operations of this flowchart.

Figure **9** depicts a flowchart of additional operation **1120** of identifying a vehicle owner to operation **1000** of Figure **4** in accordance to certain embodiments. Operation **1120** starts the operations of this flowchart. Arrow **1122** directs the use from operation **1120** to operation **1124**. Operation **1124** performs identifying a vehicle owner. Arrow **1126** directs the usage from operation **1124** to operation **1128**. Operation **1128** terminates the operations of this flowchart.

Figure **10** depicts a detail flowchart of operation **1016** of responding to the radio program selection confirmation in accordance to certain embodiments. Arrow **1140** directs the use from starting operation **1016** to operation **1142**. Operation **1142** performs ordering the radio program selection. Arrow **1144** directs the usage from operation **1142** to operation **1146**. Operation **1146** terminates the operations of this flowchart. Arrow **1150** directs the use from starting operation **1016** to operation **1152**. Operation **1152** performs canceling the radio program selection. Arrow **1154** directs the usage from operation **1152** to operation **1146**. Operation **1146** terminates the operations of this flowchart.

Note that usage may either perform ordering the radio program selection or canceling the radio program selection. Cancellation may be automatic in certain embodiments after a certain predetermined time interval has elapsed.

Figure **11** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments. Arrow **1170** directs the use from starting operation **1124** to operation **1172**. Operation **1172** performs speaking

an owner identifying signature sequence. Arrow **1174** directs the usage from operation **1172** to operation **1176**. Operation **1176** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1172** may be performed only once during a radio program session. In certain further embodiments, such a radio program session may be terminated if there is no user response within a predetermined time interval.

Figure **12** depicts a flowchart of additional operation **1190** of initializing the owner identifying signature sequence to operation **1120** of Figure **9** in accordance to certain embodiments. Operation **1190** starts the operations of this flowchart. Arrow **1192** directs the use from operation **1190** to operation **1194**. Operation **1194** performs initializing the owner identifying signature sequence. Arrow **1196** directs the usage from operation **1194** to operation **1198**. Operation **1198** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1190** may be performed once upon purchasing the device being used. In certain further embodiments, more than one owner identifying signature sequence may be initialized. In certain alternative embodiments, operation **1190** may be performed after purchasing the device being used.

Figure **13** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments. Arrow **1210** directs the use from starting operation **1124** to operation **1212**. Operation **1212** performs pushing an owner identifying button sequence. Arrow **1214** directs the usage from operation **1212** to operation **1216**. Operation **1216** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1212** may be performed only once during a radio program session. In certain further embodiments, such a radio program session may be terminated if there is no user response within a predetermined time interval.

Figure **14** depicts a flowchart of additional operation **1190** of initializing the owner identifying button sequence to operation **1120** of Figure **9** in accordance to certain embodiments. Operation **1230** starts the operations of this flowchart. Arrow **1232** directs the use from operation **1230** to operation **1234**. Operation **1234** performs initializing the owner identifying button sequence. Arrow **1236** directs the usage from operation **1234** to operation **1238**. Operation **1238** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1230** may be performed once upon purchasing the device being used. In certain further embodiments, more than one owner identifying button sequence may be initialized. In certain alternative embodiments, operation **1230** may be performed after purchasing the device being used.

Figure **15** depicts a detail flowchart of operation **1124** of Figure **9** identifying said vehicle owner in accordance to certain embodiments. Arrow **1250** directs the use from starting operation **1124** to operation **1252**. Operation **1252** performs pressing a fingerprint scanner. Arrow **1254** directs the usage from operation **1252** to operation **1256**. Operation **1256** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1252** may be performed only once during a radio program session. In certain further embodiments, such a radio

program session may be terminated if there is no user response within a predetermined time interval.

Figure **16** depicts a flowchart of additional operation **1270** of initially pressing the fingerprint scanner to operation **1120** of Figure **9** in accordance to certain embodiments. Operation **1270** starts the operations of this flowchart. Arrow **1272** directs the use from operation **1270** to operation **1274**. Operation **1274** performs initially pressing the fingerprint scanner. Arrow **1276** directs the usage from operation **1274** to operation **1278**. Operation **1278** terminates the operations of this flowchart.

Note that in certain embodiments, operation **1274** may be performed once upon purchasing the device being used. In certain further embodiments, more than one owner fingerprint scan may be initialized. In certain alternative embodiments, operation **1274** may be performed after purchasing the device being used.

Figure **17** depicts a detail flowchart of operation **1142** of ordering the radio program selection Figure **10** in accordance to certain embodiments. Arrow **1290** directs the use from starting operation **1142** to operation **1292**. Operation **1292** performs pressing the fingerprint scanner. Arrow **1294** directs the usage from operation **1292** to operation **1296**. Operation **1296** terminates the operations of this flowchart.

Figure **18** depicts a flowchart controlling a vehicular radio-based program selection and ordering system. Operation **1400** starts the operations of this flowchart. Arrow **1402** directs the flow of execution from operation **1400** to operation **1404**. Operation **1404** performs receiving a coded radio program data channel. Arrow **1406** directs execution from operation **1404** to operation **1408**. Operation **1408** performs sensing a radio program. Arrow **1410** directs execution from operation **1408** to operation

1412. Operation **1412** performs determining selection of said sensed radio program. Arrow **1414** directs execution from operation **1412** to operation **1416**. Operation **1416** performs displaying the radio program confirmation from the received coded radio program data channel whenever the radio program is sensed. Arrow **1418** directs execution from operation **1416** to operation **1420**. Operation **1420** performs sensing a response to the displayed radio program confirmation and said selection of said sensed radio program. Arrow **1422** directs execution from operation **1420** to operation **1424**. Operation **1424** terminates the operations of this flowchart.

Figure **19** depicts a detail flowchart of operation **1404** of Figure **18** receiving a coded radio program data channel in accordance to certain embodiments. Arrow **1440** directs the flow of execution from starting operation **1404** to operation **1442**. Operation **1442** performs sensing an internal radio program data channel. Arrow **1444** directs execution from operation **1442** to operation **1446**. Operation **1446** performs processing the sensed internal radio program data channel to create a radio program data descriptor stream. Arrow **1448** directs execution from operation **1446** to operation **1450**. Operation **1450** terminates the operations of this flowchart.

Figure **20** depicts a detail flowchart of operation **1412** of Figure **18** sensing the radio program in accordance to certain embodiments. Arrow **1470** directs the flow of execution from starting operation **1412** to operation **1472**. Operation **1472** performs sensing a radio program channel number to create a sensed radio channel number. Arrow **1474** directs execution from operation **1472** to operation **1476**. Operation **1476** performs decoding the radio program data descriptor stream based upon the sensed radio channel number to create a radio program data descriptor for the sensed radio program. Arrow **1478** directs execution from operation **1476** to operation **1480**. Operation **1480** terminates the operations of this flowchart.

Figure **21** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation in accordance to certain embodiments. Arrow **1500** directs the flow of execution from starting operation **1416** to operation **1502**. Operation **1502** performs generating a radio program confirmation text. Arrow **1504** directs execution from operation **1502** to operation **1506**. Operation **1506** performs displaying the radio program confirmation text. Arrow **1508** directs execution from operation **1506** to operation **1510**. Operation **1510** terminates the operations of this flowchart.

Figure **22** depicts a detail flowchart of operation **1420** of Figure **18** sensing the response to the displayed radio program confirmation in accordance to certain embodiments. Arrow **1530** directs the flow of execution from starting operation **1420** to operation **1532**. Operation **1532** performs ordering the selected radio program. Arrow **1534** directs execution from operation **1532** to operation **1536**. Operation **1536** terminates the operations of this flowchart.

Arrow **1540** directs the flow of execution from starting operation **1420** to operation **1542**. Operation **1542** performs determining to cancel the selected radio program. Arrow **1544** directs execution from operation **1542** to operation **1536**. Operation **1536** terminates the operations of this flowchart.

Figure **23** depicts a detail flowchart of operation **1532** of Figure **22** ordering the radio program in accordance to certain embodiments. Arrow **1560** directs the flow of execution from starting operation **1532** to operation **1562**. Operation **1562** performs determining to order the selected radio program. Arrow **1564** directs execution from operation **1562** to operation **1566**, whenever operation **1562** is asserted (Yes). Operation **1566** performs sending a radio program buy message for the selected radio program. Arrow **1568** directs execution from operation **1566** to operation **1570**.

Operation **1570** terminates the operations of this flowchart. Arrow **1572** directs execution from operation **1562** to operation **1570**, whenever operation **1562** is not asserted (No).

Figure **24** depicts another flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments. Operation **1590** starts the operations of this flowchart. Arrow **1592** directs the flow of execution from operation **1590** to operation **1594**. Operation **1594** performs sensing a vehicle internal audio feedback channel to create a sensed vehicle audio feedback stream. Arrow **1596** directs execution from operation **1594** to operation **1598**. Operation **1598** performs processing the sensed vehicle audio feedback to create a processed vehicle audio feedback. Arrow **1500** directs execution from operation **1598** to operation **1502**. Operation **1502** terminates the operations of this flowchart.

Figure **25** depicts a detail flowchart of operation **1412** of Figure **18** determining selection of the sensed radio program in accordance to certain embodiments. Arrow **1620** directs the flow of execution from starting operation **1412** to operation **1622**. Operation **1622** performs determining the processed vehicle audio feedback to create the determined selection of the sensed radio program. Arrow **1624** directs execution from operation **1622** to operation **1626**. Operation **1626** terminates the operations of this flowchart.

Figure **26** depicts a detail flowchart of operation **1562** of Figure **22** determining to order the selected radio program in accordance to certain embodiments. Arrow **1640** directs the flow of execution from starting operation **1562** to operation **1642**. Operation **1642** performs determining the processed vehicle audio feedback to create the determined ordering of the selected radio program. Arrow **1644** directs

execution from operation **1642** to operation **1646**. Operation **1646** terminates the operations of this flowchart.

Figure **27** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments. Arrow **1670** directs the flow of execution from starting operation **1416** to operation **1672**. Operation **1672** performs audio processing the radio program confirmation text to create an audio radio program confirmation script. Arrow **1674** directs execution from operation **1672** to operation **1676**. Operation **1676** performs sending the audio radio program confirmation script to an audio output device. Arrow **1678** directs execution from operation **1676** to operation **1680**. Operation **1680** terminates the operations of this flowchart.

Figure **28** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments. Arrow **1700** directs the flow of execution from starting operation **1416** to operation **1702**. Operation **1702** performs sending a buy query for the selected radio program. Arrow **1704** directs execution from operation **1702** to operation **1706**. Operation **1706** performs receiving a response to the selected radio program buy query. Arrow **1708** directs execution from operation **1706** to operation **1710**. Operation **1710** performs generating the radio program confirmation text from the selected radio program buy query response. Arrow **1712** directs execution from operation **1710** to operation **1714**. Operation **1714** terminates the operations of this flowchart.

Figure **29** depicts a detail flowchart of operation **1416** of Figure **18** displaying the radio program confirmation text in accordance to certain embodiments. Arrow **1730** directs the flow of execution from starting operation **1416** to operation **1732**. Operation **1732** performs presenting said radio program confirmation text to a visual

output device. Arrow **1734** directs execution from operation **1732** to operation **1736**. Operation **1736** terminates the operations of this flowchart.

Figure **30** depicts another flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments. Operation **1750** starts the operations of this flowchart. Arrow **1752** directs the flow of execution from operation **1750** to operation **1754**. Operation **1754** performs initializing use for a specific user to create a signature for the specific user. Arrow **1756** directs execution from operation **1754** to operation **1758**. Operation **1758** terminates the operations of this flowchart. Arrow **1760** directs the flow of execution from starting operation **1750** to operation **1762**. Operation **1762** performs initializing a usage session for a first user utilizing the signature for the specific user. Arrow **1764** directs execution from operation **1762** to operation **1758**. Operation **1758** terminates the operations of this flowchart.

Note that operations **1754** and **1762** may be selected through a number of different mechanisms, including but not limited to pushing buttons.

Figure **31** depicts a detail flowchart of operation **1762** of Figure **30** initializing a usage session for a first user utilizing the signature for the specific user in accordance to certain embodiments. Operation **1780** starts the operations of this flowchart. Arrow **1782** directs the flow of execution from operation **1780** to operation **1784**. Operation **1784** performs sampling the first user response to create a first user signature. Arrow **1786** directs execution from operation **1784** to operation **1788**. Operation **1788** performs comparing the first user signature with the signature of the specific user to create a signature comparison. Arrow **1790** directs execution from operation **1788** to operation **1792**. Operation **1792** performs blocking access by the first user whenever the comparison is non-matching. Arrow **1794** directs execution from

operation **1792** to operation **1796**. Operation **1796** terminates the operations of this flowchart.

Figure **32** depicts a detail flowchart of operation **1790** of Figure **31** blocking access by the first user whenever the comparison is non-matching in accordance to certain embodiments. Arrow **1810** directs the flow of execution from starting operation **1790** to operation **1812**. Operation **1812** performs sending a stolen device report based upon the first user signature. Arrow **1814** directs execution from operation **1812** to operation **1816**. Operation **1816** terminates the operations of this flowchart.

Figure **33** depicts a high level system block diagram showing a computer with several forms of memory which in different embodiments provide residence for programs implementing the disclosed and claimed methods of controlling a vehicular radio. Computer **1830** is coupled to Computer Readable Memory **1840** by read access operations as indicated by arrow **1842**. At least one program implementing the method according to the present invention of controlling a vehicular radio may reside in this memory **1842** in accordance with certain embodiments. In certain further embodiments, at least one program implementing the method according to the present invention may reside in a first non-volatile memory **1846**, contained within the memory domain of computer readable memory **1840**. Some or all of this first non-volatile memory **1846**, as well as some or all of the computer readable memory **1840** may be successfully accessed by write operations as indicated by the arrow **1844** from computer **1830**. Certain preferred embodiments of the above memory system include but are not limited to RAM, battery backed up RAM, nonvolatile semiconductor memory, combinations of RAM and nonvolatile semiconductor memory, as well as RAM and disk memory of various kinds. Nonvolatile memory includes but is not limited to one or more devices embodying

ROM, EPROM, EEPROM or Flash EEPROM memory technology as well as disk memory including both electromagnetic and optical recording media.

The coupling access operations **1842** and **1844** may be carried out using a variety of mechanisms including but not limited to computer busses and addressable port communication schemes. Computer busses include but are not limited to multiplexed address and data busses, demultiplexed address and data busses, as well as encoded multiplexed address data busses. Multiplexed computer busses share bus resources for the address and data signals so that most operations involve separate bus states to transfer address and data signals. A number of solid-state disk busses are examples of multiplexed address and data bus. Demultiplexed address and data busses do not share bus resources for the address and data signals allowing for address and data signals to be transferred in a single bus state. PCI bus is an example of such a demultiplexed address and data bus. Encoded multiplexed address and data buses encode these address and data signals so that several bus states are required to transfer at least some of the address or data signals. USB (Universal Serial Bus) is an example of an encoded multiplexed address and data bus.

Computer **1830** is further coupled to a second nonvolatile memory **1850** in a fashion supporting read operations as indicated by arrow **1852**. This second nonvolatile memory **1850** may provide the residence of at least one program implementing the disclosed and claimed methods of controlling a vehicular radio. In certain further embodiments, the second nonvolatile memory **1850** may be written as indicated by arrow **1854** from computer **1830**.

A removable storage device **1860** engaged **1864** with removable storage interface **1862** and readably coupled **1866** to computer **1830** provides a residence for at least

one program implementing the disclosed methods of controlling a vehicular radio in accordance with certain embodiments.

Figure **34** depicts a summary flowchart of using a vehicular radio-based program selection and ordering system in accordance with an embodiment. Operation **1900** starts the operations of this flowchart. Arrow **1902** directs the usage from operation **1900** to operation **1000**. Operation **1000** performs operations discussed with regards to Figure **4** above. Arrow **1904** directs the usage from operation **1000** to operation **1906**. Operation **1906** terminates the operations of this flowchart.

Arrow **1910** directs the usage from starting operation **1900** to operation 1120. Operation 1120 performs operations discussed regarding Figure **9**. Arrow **1912** directs the usage from operation 1120 to operation **1906**. Operation **1906** terminates the operations of this flowchart.

Arrow **1920** directs the usage from starting operation **1900** to operation **1190**. Operation **1190** performs operations discussed regarding Figure **12**. Arrow **1922** directs the usage from operation **1190** to operation **1906**. Operation **1906** terminates the operations of this flowchart.

Arrow **1930** directs the usage from starting operation **1900** to operation **1230**. Operation **1230** performs operations discussed regarding Figure **14**. Arrow **1932** directs the usage from operation **1230** to operation **1906**. Operation **1906** terminates the operations of this flowchart.

Arrow **1940** directs the usage from starting operation **1900** to operation **1270**. Operation **1270** performs operations discussed regarding Figure **16**. Arrow **1942** directs the usage from operation **1270** to operation **1906**. Operation **1906** terminates the operations of this flowchart.

Figure **35** depicts a summary flowchart of operations controlling a vehicular radio-based program selection and ordering system in accordance with certain embodiments. Operation **1950** starts the operations of this flowchart. Arrow **1952** directs the flow of execution from operation **1950** to operation **1400**. Operation **1400** performs operations discussed regarding Figure **18**. Arrow **1954** directs execution from operation **1400** to operation **1956**. Operation **1956** terminates the operations of this flowchart.

Arrow **1960** directs the flow of execution from starting operation **1950** to operation **1590**. Operation **1590** performs operations discussed regarding Figure **24**. Arrow **1962** directs execution from operation **1590** to operation **1956**. Operation **1956** terminates the operations of this flowchart.

Arrow **1970** directs the flow of execution from starting operation **1950** to operation **1750**. Operation **1750** performs operations discussed regarding Figure **30**. Arrow **1972** directs execution from operation **1750** to operation **1956**. Operation **1956** terminates the operations of this flowchart.

Note that direction of execution to these operations may be achieved by a variety of mechanisms, including but not limited to the pushing of buttons and selection of menu options, possibly as part of an event processing mechanism within an application running on an event driven real-time operating system.

Figure **36** depicts a system block diagram of a radio for receiving a radio program data channel, and conducting transactions in accordance with certain embodiments. An embedded controller **2000** is shown including a computer readable memory **1840** containing a writeable non-volatile memory component **1846**. A receiver **2002** of said radio program data channel is coupled **2004** to the embedded controller **2000**

generating a radio program data channel stream readably accessible by the embedded controller.

A radio transceiver **2010** is coupled to the embedded controller **2012** receiving from the embedded controller transaction output messages. The radio transceiver **2010** generates a transaction input stream **2014** readably accessible by the embedded controller **2000**.

A user interface circuit **2020** is coupled to said embedded controller **2000** generating user selection data readably accessible **2024** by said embedded controller. The user interface circuit **2020** receives **2022** from said embedded controller **2000** user output data.

Figure **37** depicts a detail system block diagram system block **2002**, a receiver of the radio program data channel as shown in figure **36** in accordance with certain further embodiments. The radio further includes an external IF signal input port **2034**. The radio program data channel receiver **2002** includes a radio program data channel isolator **2030** containing an input port **2038** coupled **2032** to said external IF input signal port **2034**. The radio program data channel isolator **2030** further contains a digital output port **2038** coupled **2004** to the embedded controller **2000** providing the radio program data channel stream.

In certain embodiments the external IF signal input port **2034** may be derived from the output **110** of FM IF stage **108**, as required for reception of the RDBS sub-band. In certain alternative embodiments, the external IF signal input port **2034** may be derived from a different signal protocol transmitted independently of standard FM broadcasts. Such alternative embodiments include but are not limited to other applications AM, FM, Frequency Division Multiple Access (FDMA), Time Division

Multiple Access (TDMA), Wavelet Division Multiple Access, various spread spectrum techniques including but not limited to direct sequence (CDMA), Wideband CDMA employing both spreading and scrambling codes, frequency hopping and time hopping.

Figure **38** depicts a detail system block diagram of radio program data channel isolator **2030** as shown in figure **37** in accordance with certain further embodiments wherein the external IF signal input port supports an analog signal protocol. The radio program data channel isolator **2032** includes an analog isolation circuit **2050**. The analog isolation circuit **2050** includes a first analog input port coupled **2044** to the external IF input port **2036** and a first digital output port coupled **2048** to the radio program data channel isolator digital output. The analog isolation circuit **2050** further includes an A/D converter **2040** further comprising a second analog input port **2042** coupled **2044** to the first analog input port and a second digital output port **2046** coupled **2048** to the first digital output port.

Figure **39** depicts a detail system block diagram of analog isolation circuit **2050** as shown in figure **38** in accordance with certain further embodiments wherein the external IF signal input port supports an analog signal protocol. The analog isolation circuit **2050** includes bandpass filter **2060** containing an input port **2062** coupled **2064** to the external IF input signal **2036** and further containing a output port **2066** coupled **2068** to the A/D converter input port **2042**.

Figure **40** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface audio output interface **2080** providing **2082, 2084** audio output **2086** of the user output data. Note that in certain embodiments, user interface audio output interface **2080** can provide a digital interface. In certain alternative embodiments, user interface

audio output interface **2080** can provide an analog interface. In certain embodiments, user interface audio output interface **2080** can provide feed **2084** a mixer. In certain embodiments, user interface audio output interface **2080** can provide feed **2084** a multiplexer.

Figure **41** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface audio input sensor **2100** providing **2024** an user audio input data stream to the embedded controller **2000**. Note that in certain embodiments, audio input sensor **2100** may include an A/D converter coupling audio input **2102** to output coupling **2024**. In certain further embodiments, audio input sensor **2100** may further include an amplifier coupled between the A/D converter and audio input **2102**. In certain further embodiments, audio input sensor **2100** may further include a filter coupled between the A/D converter and the audio amplifier.

Figure **42** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a visual output device **2100** providing visual output **2122** of the user output data **2022**. The visual output device **2100** in certain embodiments includes but is not limited to a Light Emitting Diode Device (LED), which may further include a multiplicity of Light Emitting Diode components. The visual output device **2100** in certain embodiments may include but is not limited to a flat panel display device such as found in a variety of calculators, handheld computers and notebook computers.

Figure **43** depicts a detail system block diagram of user interface **2020** as shown in figure **36** in accordance with certain embodiments supporting a user interface tactile input sensor **2140** providing an user tactile input data stream **2024**. Figures **44** and **46** demonstrate two embodiments of devices included in user interface tactile input

sensor **2140** providing tactile input support. Such figures are not meant to limit the scope of user tactile input, but rather to provide examples advantageous in certain applications. Other examples include but are not limited to touch pads and proximity sensors.

Figure **44** depicts a detail system block diagram of user interface tactile input sensor **2140** as shown in figure **43** in accordance with certain embodiments supporting a user interface tactile input sensor **2140** including a button sensor **2160**. Button sensor **2160** includes a button input port **2166** coupled **2164** to button input **2162**. In certain embodiments, button input **2162** includes multiple buttons and an interface circuit. In certain embodiments, button input **2162** included button debounce circuitry. In certain embodiments, button input **2162** provides a binary state value related to pushing or not pushing the related button. In certain embodiments, button input **2162** further provides more detailed motion related information, such as key acceleration and release.

Figure **45** depicts a detail system block diagram of user interface tactile input sensor **2140** as shown in figure **43** in accordance with certain embodiments supporting a user interface tactile input sensor **2140** including a fingerprint scanner **2180**. The coupling **2184** of user finger **2182** to input port **2186** of fingerprint scanner **2180** may include a CCD array in certain embodiments. In certain further embodiments, inut coupling **2184** may further include a pressure sensor to indicate when user finger **2182** is positioned for a fingerprint scan. In certain alternative embodiments, input port **2186** may include a CCD array.

Figure **46** depicts a detail system block diagram of radio transceiver **2010** as shown in figure **36** in accordance with certain embodiments supporting the radio transceiver **2010** including a cellular telephone **2200**. Cellular telephone **2202** is coupled **2204** to